Improving newborn and pediatric quality of care by strengthening access to safe use of oxygen, pulse oximetry, and infection prevention and control measures

BANGLADESH’S EXPERIENCE

Context

Bangladesh has experienced a significant reduction in child mortality over the past decades but the mortality among children under the age of five remains relatively high at 45 deaths per 1000 live births. Pneumonia has been the leading cause of morbidity and mortality among under-5 children for more than 3 decades in Bangladesh. Hypoxemia is present in an estimated 13.3% of severe pediatric pneumonia cases, and early detection of hypoxemia and oxygen therapy can greatly improve the chances of survival. In addition, the correct identification of hypoxemia and safe use of oxygen during management of newborn hypoxemia, especially in preterm neonates, can save lives while reducing complications such as retinopathy of prematurity and damage to the newborn’s lungs and brain.

Availability of reliable oxygen supplies and fully trained human resources remain a challenge in Bangladesh. The COVID-19 pandemic has further exposed underlying gaps in oxygen systems, and a recent national facility assessment revealed that 70% of the hospitals did not have the required basic oxygen supply system in the maternal, pediatric, and newborn units.

Between October 2020 and June 2021, National Newborn Health Program and Integrated Management of Childhood Illness Program (NNHP & IMCI Program), with support from UNICEF and funding by USAID, implemented an initiative to “Improve newborn and pediatric quality of care through improved availability and timely access to safe provision of medical oxygen” in Tangail General Hospital and Chattogram Medical College Hospital. The initiative aimed to leverage COVID-19 investments in increased oxygen scale-up to strengthen ongoing efforts to improve maternal, newborn and pediatric quality of care (QoC).

Efforts to improve quality of care

One priority in Bangladesh’s health agenda is improving QoC, and, over the past 10 years, Bangladesh has made great strides in implementing the WHO Standards to improve Maternal and Newborn QoC2 in health facilities through introducing Every Mother Every Newborn (EMEN) standards.

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1 National Institute of Population Research and Training (NIPORT), and ICF. 2019. Bangladesh Demographic and Health Survey 2017-18: Key Indicators. Dhaka, Bangladesh, and Rockville, Maryland, USA: NIPORT, and ICF.


Teams were encouraged to learn and implement small PDSA (Plan-Do-Study-Act) projects focused on quality of maternal, newborn and child health services, mentoring and learning, increased use of data, and social accountability, which are critical elements of quality improvement.

Professional bodies (the Bangladesh Pediatric Society, Bangladesh Neonatal Forum, and Obstetric and Gynecological Society of Bangladesh), UN organizations (WHO, UNICEF), development partners and the NNHP & IMCI Program were involved for the development of technical documents and capacity development activities of service providers.

Mentoring and monitoring capacity of the service providers was enhanced through structured training at national and district levels, and through digital platforms (e.g. webinars).

An orientation webinar was organized on the Quality-Equity-Dignity (QED) indicators⁴ and a database was developed with support from WHO, which enabled integration of the maternal and newborn quality of care indicators (EMEN/QED) into the routine District Health Information System (DHIS2) for monitoring and reporting. A dashboard was created to track important EMEN-related indicators (e.g. emergency obstetric and newborn care signal functions, case fatality rates, service utilization of antenatal care, intrapartum and postnatal care, and quality indicators).

These existing structures and processes for QoC were leveraged for the initiative to improve access to and safe use of oxygen, to introduce the WHO Standards for improving the quality of care for children and young adolescents in health facilities⁵ and to expand efforts around QI to include pediatric QoC.

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⁴ Quality of care for maternal and newborn health: A monitoring framework for network countries, 2019
⁵ WHO 2018, Standards for improving the quality of care for children and young adolescents in health facilities
COVID-19 has had an immense direct and indirect impact on the people of Bangladesh, infecting hundreds of thousands of people and taking several thousand lives, affecting the poorest and most vulnerable with the greatest severity. Access and utilization of essential maternal, newborn and child health (MNCH) services including antenatal care, institutional deliveries, pediatric and newborn admissions, and access to IMCI and treatment for pneumonia, reduced significantly during the first months of the COVID-19 epidemic in Bangladesh. Successful mitigation efforts included the introduction of a national guideline on MNCH services during COVID-19, a guideline on infection prevention and control (IPC), and continuous mentoring and monitoring by the national and local level managers.

In June/July 2020, the Directorate General of Health Services (DGHS) of the MOHFW, with support from UNICEF and other partners, conducted a Health Facility Preparedness and Readiness assessment for the COVID-19 response across 120 health facilities, including specialized medical college hospitals, district hospitals, upazila health complexes, non-governmental facilities, and private health centers across eight divisions of the country. The two hospitals selected for this initiative were also included in this assessment.

The assessment investigated critical care management and access to essential supplies related to the COVID-19 response. It found that 88% of the doctors were not trained on COVID-19 case management including critical care, and only 70% of the facilities had the necessary critical care guidelines for COVID-19. It also found that 70% of the facilities did not have adequate oxygen infrastructure including oxygen plants, LMO systems, oxygen concentrators, pulse oximeters, or other essential oxygen equipment.

**Baseline situation**

In November 2020, a baseline assessment was carried out to assess the situation of oxygen and IPC in the two hospitals, showing:

- No facility staff had received training on newborn and pediatric QoC standards since these facilities were not part of previous QI projects.
- The staff working in Special Care Newborn Units (SCANUs) and the pediatric ward had received training on Emergency Triage, Assessment and Treatment (ETAT) and IMCI, but were not fully trained in pediatric and newborn hypoxemia management with rational and safe oxygen therapy due to the lack of a national guideline on rational use of oxygen.
- QI committees were not active and no QI project had been done in either hospital during the previous three months.

**Tangail General Hospital and Chattogram Medical College Hospital**

Tangail General Hospital is a 250 bed district level hospital in Tangail district of Mymensingh division with 20 neonatal and 35 pediatric beds. Chattogram Medical College Hospital is a 1300 bed tertiary level specialized hospital in Chittagong district of Chittagong division, with 130 neonatal and 105 pediatric beds. Neither hospital had been part of specific previous QI efforts in the country to strengthen maternal and newborn QoC.

Additional gaps included insufficient training of staff in proper handling and maintenance of oxygen equipment as well as lack of a monitoring system for nurses and medical officers resulting in suboptimal regulation of oxygen flow for children.
Key actions

Strengthening partnerships
Partnerships were strengthened with the NNHP & IMCI Program and an action plan was developed, resulting in the joint launch of a national guideline and training module for oxygen therapy and pediatric QoC standards under the leadership of NNHP & IMCI Program, both of which were endorsed by the national curriculum approval committee.

A technical committee was established under DGHS with representation of professional bodies, QI technical experts, and partners, who led the development of the guideline and training package, and supported the roll-out of capacity development activities for doctors and nurses from the two selected facilities, and subsequently to 13 districts. The QI initiative was implemented through the existing partnership with QIS and NIPSOM, who carried out the baseline assessment and gap analysis of the intervention facilities on the oxygen management situation and newborn and pediatric OoC.

Improving infrastructure
Based on the facility assessment, placement of oxygen lines to patient beds and availability of pulse oximeters were improved in the two facilities, and the oxygen supply system and equipment management systems were both strengthened.

A triage and screening system, as well as a fever corner applying improved IPC measures, were established in both facilities. To ensure water, sanitation, and hygiene, hand washing stations were installed and access to safe drinking water was ensured in strategic areas including the newborn and pediatric wards and waiting areas. In addition, improvements were made to the waste management system.

Capacity building
Prior to this initiative, few doctors at the two facilities had received QI training, and there had been no initiation of the Plan-Do-Check-Act (PDCA) approach in either facility. Work improvement teams were non-functional and QI committee meetings were not held regularly.

QI training using the point of care quality improvement manual (POCQI) and PDCA was completed in both of the hospitals, facilitated by NIPSOM, reaching 26 doctors and 41 nurses.

Nine doctors and 43 nurses working in the pediatric ward and SCANU, including the IMCI corner, received three days of training on safe and rational use of oxygen for hypoxemia management in newborns and children using the newly developed training package.

Oxygen monitoring checklists and a daily case sheet were introduced, and facility staff were trained on integrating this checklist using the PDCA approach in the pediatric ward and SCANUs. Using this checklist improved the detection of hypoxic infants for prompt response.

Two days hands-on training on IPC was provided to MNCH and IPC officers, and additional relevant facility staff.

Monitoring and evaluation
Indicators for hypoxemia measurement and oxygen use were included in the national health management information system (DHIS2) in order to monitor progress and
sustain the improvement in quality of services. (Box 1) Reporting from SCANUs and pediatric wards was initiated in 13 districts.

Impact

The project showed a positive impact on the management of hypoxemia in the SCANUs and pediatric wards of Tangail and Chittagong Hospitals. At the end of project, in Tangail Hospital, 100% of beds in the SCANU and pediatric ward and 60% of beds in the gynecology & obstetrics ward now have oxygen lines. In Chittagong Hospital, 40% of the beds in the SCANU and in the pediatric ward have oxygen lines. There is a plan to extend lines for all beds by the National Electromedical Equipment Unit (NEMEU), which is now under progress in Chittagong Hospital.

- In Tangail Hospital, 100% of newborns and children with hypoxemia were assessed and received oxygen as per standard protocol and 86% of hypoxic newborns have their oxygen saturation monitored twice in a day with a pulse oximeter.

- In Chittagong Hospital, 50% of hypoxemic newborns (up from 12%) were assessed and received oxygen as per standard protocol, and monitoring improved from 5% to 50% of the inpatient newborns being monitored with pulse oximeters.

- After the IPC training and QI monitoring, the percentage of staff completing hand washing when entering into SCANU in Tangail Hospital increased from 40% to 100% which reduced septicemia and sepsis-related death in the SCANU.

- Temperature recording of newborns immediately after birth had not previously been properly maintained and,
after the QI initiative, temperature was maintained in 100% of cases. Temperature recording charts of newborns are now carefully maintained in the labor ward and the number of cases of hypothermia reduced by 60%.

- Overall, the percentage of newborns receiving Kangaroo Mother Care improved and the length of hospital stay of preterm neonates has been reduced.

Lessons learned

The onset of the COVID-19 pandemic exposed gaps in the health system that the government of Bangladesh and partners needed to work upon to create a more resilient system. Specifically, improvements were needed to manage respiratory and other health conditions that require medical oxygen and improved QoC.

The long-standing partnership of UNICEF with the Bangladesh MOHFW, DGHS, and other partners, facilitated the assessment and implementation of this initiative, leveraging resources and technical assistance to advance the health system strengthening agenda in the country. The initiative was implemented within a short period of time with the leadership of DGHS, leveraging the national guideline on oxygen therapy and WHO pediatric QoC standards.

Both facilities that were part of this initiative have been upgraded with an LMO plant, air, and oxygen piping as per standards. As many of the doctors and nurses have been capacitated to manage children with hypoxemia using oxygen safely following the standards, improvements will continue along with the use of a daily monitoring case sheet. New indicators for oxygen included in DHIS will now be reported on a regular basis.

Potential gaps include the availability and time of human resources to sustain the QI strategies and to continue PDCA without additional technical support.

Sustainability and next steps

The learnings from this initiative, as well as the tools and approaches developed, have already been scaled up to 13 districts in Bangladesh to advance the uptake of the QoC standards for newborn and pediatric care, with special focus on oxygen therapy for management of hypoxemia. The national guideline on oxygen therapy and pediatric
standards, the national training module on oxygen therapy and pediatric standards, and the facilitator’s guidelines have been approved by the national technical committee. The oxygen component is being integrated into on going pediatric QoC activities steered by the NNHP & IMCI Program section of DGHS with technical support from UNICEF.

The Government of Bangladesh included the scale up of oxygen therapy and pediatric QoC standards and initiatives in the Maternal, Newborn, Child, and Adolescent Health Operational Plan of the Health Sector. The ongoing oxygen initiative facilitated by UNICEF in Bangladesh will culminate into developing a comprehensive oxygen landscape and a national medical oxygen plan to ensure longterm oxygen access in Bangladesh.

Further reading and watching

National guidance and training package:

- National guidelines on use of oxygen therapy for management of newborn and paediatric hypoxaemia
- Facilitator’s guide for training module on newborn and paediatric quality of care standards & use of oxygen therapy for management of hypoxemia
- Training module on newborn and paediatric quality of care standards & use of oxygen therapy for management of hypoxemia

Video: Improving quality of care for small and sick newborn and children in health facilities - safe use of oxygen

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